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The evolution of behaviour management

By Dr. Marko Milosevic

Today's dentists enjoy many advantages compared to their predecessors. The dental environment is designed to be child-friendly. Contemporary materials, technology, and trained support staff supplement the ambiance. Yet, the task of paediatric dentists is the same as it was a generation ago: to perform precise surgical procedures on children whose behaviour may range from cooperative, to hostile, to defiant (Sheller, 2004).

Behavioural management is the process of modifying the patient's response to care, and developing coping strategies as well as self-esteem building. The process involves not only the dentist and the patient, but also the dental team and the parents. The goals are to establish effective communication, alleviate fear and anxiety, and deliver quality dental care in a safe environment, while at the same time building a positive relationship with the patient and their family, and allowing the child to develop a positive self-esteem in relation to their dental health.

This essay will briefly discuss the various behavioural management techniques utilised throughout the past five decades, draw comparisons between contemporary behavioural management and outdated techniques, suggest possible causes for these changes and then describe the use of these techniques internationally.

Historical techniques

Historically, the use of aversive, or negative re-enforcement style techniques was relatively common, and whilst they worked efficiently for traditional practitioners with training in these behavioural methods, early pundits recognised the hollow victory of a successful dental procedure if a child was left in tears and fear of return. Due to gradual cultural shifts in parenting styles and the availability of modern guidance methods, these techniques have fallen out of favour with both parents and practitioners.

The Hand-Over-Mouth (HOM) technique is one of these history methods which was frequently utilised 50 years ago, with textbooks frequently rationalising and advocating the use of active restraint with hand-over-mouth and airway obstruction for unco-operative children (Strange, 2014). HOM has been an accepted behaviour management technique in paediatric dentistry for many years. In a 1972 survey of American Paediatric Specialists, only 20% of survey respondents indicated they never used the technique. The remaining 80% used the technique with children ages 2 to 9, primarily when resistant or hysterical behaviours were demonstrated (AAPD, 1972). Similar results were reported by Levy and Domoto (1979), who reported that 88% of paediatric dentists used HOM in the state of Washington in 1979.

Over the next two decades the use of HOM use significantly reduced. By the early 2000's, HOM was commonly be reported as the least often utilised method for behavioural guidance in paediatric dentistry. Adair and colleagues (2004) surveyed members of the American Academy and found that only 21% of respondents would consider the use of HOM technique. Decreased use over the previous 5 years was reported by 50% of the study population, with a further 25% claiming they will aim to reduce the use of the technique over the next 2-3 years.

Eaton and colleagues (2005) showed that these reductions were mirrored by the decreasing parental acceptability of the techniques. In their survey, the authors found that HOM was the least acceptable method for behavioural guidance, with majority of parents reporting the use of the technique was never appropriate. This is in sharp contrast to an early studies in 1984, which showed parental favour for HOM instead of using advanced behavioural management techniques such as sedation, general anaesthesia and papoose board stabilisation.

The HOM technique was eventually removed from the AAPD guidelines in 2007. Locally in Australia, the use of the technique is minimal, with 92% of survey

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by Dr Sue Cartwright

BDS, Dip Clin Dent, M Ed

October 14
Mark your diary!

World Cavity-Free Future Day

In 2017 ACFF ANZ ran a campaign to promote drinking water instead of sugary alternatives. This campaign was supported by Colgate and the ADA. Thanks to the many dental practices around Australia who participated by encouraging patients and their communities to drink water and engage with the digital campaign using #choosewater. The campaign was very successful reaching approximately 1.4 million people and winning the Global ACFF Award for the best campaign in 2017, against stiff competition from around the world. Congratulations to the team!

ACFF ANZ will be running a similar campaign again this year on World Cavity Free Future Day, Oct 14 – join us to help promote oral health!

Alliance for a **Cavity-free Future Grants**

Are you thinking about doing some research to help reduce dental caries in communities?

Email susan_cartwright@colpal.com for application forms for ACFF Grants proudly supported by Colgate. Applications close on Nov 1, 2018 for the 2019 round of funding.

You will find information about the amazing projects that have been undertaken so far in our region at www.acffglobal.org/acff-chapter/anz/#Grants. Since this program started in 2015, there have been 17 projects funded. Each of these is adding to our understanding of barriers and enablers to promoting oral health and helping us to work towards our goal of every child born in 2026 and beyond, being cavity-free for their lifetime.

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respondents saying that the technique is very rarely or never utilised for the provision of specialist dental care in the state of Victoria (Wright et al., 1991). A national survey by the same group showed that 74% of survey respondents claimed never to use the technique, and if used, was most likely to be utilised by Adelaide graduates (Wright et al., 1991).

Less controversial is the contingent reinforcement technique of Parental Presence/Absence in the dental surgery, with the absence being a negative reinforcement of undesired patient behaviour. Historically, without the availability of pharmacological management options, dentists would often turn to general contemporary child-rearing philosophies focusing on the "captain of the ship" approach of doctoral superiority. It was commonly believed that the parental presence in the dental surgery would undermine this approach, and facilitate unwanted or disruptive behaviour (Feigal, 2001). As our understanding of parental involvement has evolved, the approach of parental involvement has become central in facilitating effective health care provision. It has become important for parents to see and understand the work that we do in terms of communication, guidance and kindness towards their children. This isn't only important from a legal viewpoint of informed consent, but it also applies to the ethos that effective behavioural management involves more than just the dentist and the patient.

Restraint can also be considered a technique which has questionable application in todays' treatment ethos. The passive or active restriction of a patient can allow the decreased risk of injury and allow safe completion of treatment in a timely manner, however, it must be considered that consent is a crucial factor affecting the application of this technique. While the use of a passive restraint device like a bite block is common for treatment under general anaesthesia, its use in a clinical setting is based on the patient's permission of use. Active stabilisation can be very common, such as during provision of local anaesthetic where a dental assistant may hold the hands of the child to prevent potential trauma to the patient.

The use of protective stabilisation however is more controversial. Papoose boards, although common in some countries, are not used in Australia. The use of protective wraps can be considered for specific scenarios where it will facilitate the provision of care and avoid more invasive techniques such as sedation or general anaesthesia. Protective stabilisation must be explicitly explained to the patient and parents so that informed consent may be attained prior to the procedure, and should never be used as an aversive technique (Oliver & Manton, 2015).

Contemporary approach

Non-pharmacological behavioural management techniques (BMT) have been the staple of Paediatric Dentists and the way we provide care to our patients for decades. Techniques such as Tell-Show-Do (TSD), positive reinforcement, distraction, modelling and voice control have always been generally well regarded by both practitioners and parents as effective management techniques, with TSD often described as the most acceptable for use (Eaton et al., 2004). In addition to these non-pharmacological approaches, the utilisation of nitrous oxide, sedation and general anaesthesia provides a continuum of contemporary behaviour guidance, with pharmacological techniques being utilised more commonly in recent decades.

As the traditional aversive techniques are ageing, younger generations of paediatric dentists are prefering to utilise pharmacological approaches and include increasingly the parental presence in the surgery, and a heavy emphasis on communication techniques (Strange, 2014). The study by Eaton and colleagues examined parental attitudes towards behaviour management techniques presently used in modern paediatric dentistry (Eaton et al., 2005). The authors compared the use and acceptance of the most common management techniques in their survey to previous results from similar studies in the 1980's and 1990's. TSD has consistently been the most accepted technique by parents across the three decades, however over the last 20 years there has been an increasing acceptance of parents for the use of pharmacological management in the forms of nitrous oxide and general anaesthesia, with the methods being ranked second and third respectively in the 2005 survey. As briefly discussed above, the use of passive restraint has significantly decreased, and along with the hand-over-mouth technique is ranked as the least acceptable method for behaviour management.

It has been reported that British dentists were comfortable in applying behaviour management techniques with TSD being the most common technique used (Crossley & Joshi, 2002). Parental acceptability of the techniques is generally high for non-invasive techniques; while child restraint and historically pharmacological agents least acceptable (Machen JB, 1984).

One study attempted to gauge Thai children's perceptions and attitudes towards behaviour management techniques by showing video-recordings demonstrating their use. Positive reinforcement and TSD had the highest approval although surprisingly the children showed more approval of restraint and pharmacological methods over voice control (Kantaputra et al., 2007).

In Israel, Peretz et al. (2003) showed that dentists used TSD and material reinforcement more than any other behaviour management strategies. A more recent study by the same group confirmed that non-pharmacological BMT's were significantly more acceptable by parents compared to procedural sedation. Whereas in Australia, the most common strategies used were: permitting the child to exercise some form of control over terminating the treatment if they were experiencing difficulties, furnishing waiting areas with play materials, and using a TSD approach. Few of the Australian dentists used hand-over-mouth technique (Wright et al., 1991). Younger dentists tended to use behavioural strategies more frequently than older practitioners. Women dentists more frequently than male dentists used strategies including spending more time with the child before entering the operatory; setting shorter appointment sessions; and permitting the child to hold a toy or a mirror during dental treatment.

Conscious sedation

Various sedation techniques using many different anaesthetic agents have gained considerable popularity over the past 30 years. While the practice of sedating patients for dental procedures is invaluable in the management of suitably assessed patients, patient safety must always be the primary concern.

Nitrous oxide or conscious sedation may be used as an adjunct to nonpharmacological BMT to enhance patient communication, reduce anxiety, and facilitate safe delivery of care. Historical records of usage comes from surveys of ADA members in the US. In the 1970's, approximately 35% of dentists reported the infrequent/previous experience with the use of nitrous oxide

sedation. Routine use of nitrous oxide was reported by 46% of paediatric dental specialists by 1994 (ADA, 1994). In 1996, Wilson reported that 85% of paediatric specialists routinely use nitrous oxide sedation in their weekly practise (Wilson, 1996).

In a recent survey of the AAPD membership in the US, the authors compared the reported use of N2O and sedatives to the previous survey from 1996 (Wilson & Gosnell, 2016). A significant increase in the weekly use of nitrous sedation was evident, with only 3% of dentists surveyed saying they do not use nitrous sedation for restorative appointments compared to 15% in 1996, as well as the perception that a greater proportion of the paediatric population required nitrous sedation. The majority reported that 61 to 80 percent of their patient pool required nitrous oxide use versus one to 20 percent of patients in 1996. This likely reflects a combination of increased parental acceptance of this behaviour guidance technique, changing parental styles, and younger practitioners preferring nitrous sedation for behavioural management of children. There was no such change in the use of concomitant nitrous sedation and oral sedatives, with 40% of participants saying they do not use the combination, which is similar to 39.2% in the previous study.

White and colleagues assess the parental perception of conscious sedation for dental treatment (White et al., 2016). The authors found that the highest predictor for acceptance of a sedation procedure was related to their child's response; as the patient activity/response level increased, the acceptance of the process significantly decreased. Overall, 80% of parents reported that procedural sedation was an acceptable method for provision of dental treatment. This was in contrast to the Israeli group that showed that only 9% of parents found procedural sedation acceptable, 15% totally unacceptable, and 75% dislike the option but would consent only if really needed (Peretz et al., 2013). Parents were much more accepting of non-pharmacological BMT such as TSD (77%) and positive reinforcement (81%).

The United Kingdom considered properly administered conscious sedation as an effective and safe alternative to general anaesthesia in appropriate circumstances for provision of dental care. The establishment of the oral sedation clinics at the King's College Hospital has resulted in children with infection or in pain receiving treatment within a few weeks of referral. Without sedation these children would have had to wait for many months for general anaesthesia (Lourenco-Matharu & Roberts, 2010). The authors reported that 10% of children presenting were treated on the same day, and an additional 12% within the first week, with longer delays attributed to family arrangements or attempts for management with local anaesthesia only. Short appointments were planned although treatment including restoration or extraction of up to 6 teeth was reported for a single visit.

Globally a similar trend has been reported, however, there are concerns regarding the variation on the definitions and techniques for the use of sedations between countries. Depending on the governing body, recommendations limit the use of a single-drug mode of conscious sedations, such as seen in Australia, compared to commonly utilized poly-pharmacy approach seen in the United States.

In Australia, procedural sedation has also gained popularity in recent times. Wilson & Alcaino aimed to survey members of the IAPD and EAPD on their use of pharmacological BMT's (Wislon & Alcaino, 2011). The authors found that the most common use of sedation was general anaesthesia (52%), followed by nitrous oxide (46%) and then oral sedation (44%). 75% of respondents used either nitrous sedation alone, or in combination with oral sedatives. A reported success of 70% was reported when oral sedatives were used excluding the use of nitrous oxide sedation.

General anaesthesia

The dental management of children under general anaesthesia is often prescribed for children with a large treatment burden, behavioural/co-operative difficulties or medical histories too severe to warrant the dental treatment in conventional settings. These services are very resource intensive, whether it be to the public tax-payer, or the family undergoing the treatment privately. This management is usually provided in urban hospital centres, with strict pre and post-procedural precautions which may impact on all aspects of the OHRQoL for the family, especially for those from rural or remote locations.

This ever increasing burden on the health care systems has led to a rise of regulation in order to guide the development of appropriate provision of care under general anaesthesia, while allowing the reorientation of primary dental services towards alternate pharmacological techniques such as conscious sedation in order to reduce the pressure on services, as well as reduce the overall risk of management under general anaesthesia.

Since 1998, there has been a significant decline in the use of General Anaesthesia in the United Kingdom following the introduction of new Dental Council guidelines, and correspondingly a drastic increase in the use of conscious sedation as an alternative, with an aim to reduce the risks of mortality associated with dental treatment under general anaesthesia (Dept. of Health, 2000). The overall number of general anaesthetics for general dental services in the UK dropped by 80% following the issue of this guidance.

Ongoing review of dental general anaesthetic procedures in the NHS have shown that although efforts are made to reduce the number of DGA's provided for routine care, up to 30% of lists are not achieving the target of comprehensive care as outlined by the previous report (Robertson et al., 2012). Efforts are encouraged by the Royal College of Surgeons to have children dentally fit by the end of the single GA, by either providing restorative care pre-operatively, or by restricting the number of patients seen on a list, and therefore the number of DGA's being provided (Davies et al., 2008).

A review of hospital records from Westmead Centre for Oral Health between 1983 and 1996 showed a significant increase in the utilization of general anaesthesia for the provision of dental care for patients under the age of 16 (Alcaino et al., 2000). The total number of patients treated increased from 189 in 1984 to 777 in 1996. There was no significant difference in the mean age of patients with the majority being younger than 6 years old. The study highlighted that until 1990, the increase in treatment was directly proportional to the availability of theatre sessions, and however, after 1990 the gradual increase without increased availability of theatre time resulted in significant increases in waiting list times from months to up to 2 years.

National data from the Hospital Morbidity Database from the Australian Institute of Health and Welfare shows that between 1993 and 2004, there was a 3 fold increase in rates of dental general anaesthetics for

Australian children (Jamieson & Roberts-Thompson, 2006).

There are a number of moderating factors that influence the options of child behavioural management including general views of society, parents and their children, insurance bodies, regulatory bodies, legal systems and the education, expectation and experience of paediatric dental professionals.

Societal change

We need to consider that 50 years ago, consideration for the physical, mental and emotional health of children was not as important as it is today. With our evolution of a more sophisticated patient-oriented approach to healthcare comes the holistic approach which combined child and family management, where parents are now a focal point of the decision making process through informed consent, and are largely involved in routine paediatric healthcare (Feigal, 2001). However, this did not translate into changing the approach for paediatric dental management until the early studies of parental acceptance of common behavioural management techniques in the 80's and 90's (Murphy et al., 1984; Lawrence et al., 1991), which showed that most of the procedures were rated unfavourably by parents.

Parental changes

Adair and colleagues showed that members of the AAPD were commonly altering their procedural approach based on the wishes of their patient base, and according to the willingness to consent (Adair et al., 2004). It should be considered that the traditional role of the parent has changed within society, from one of setting boundaries and limitations, to one of aiming to befriend their children.

In a 2002 survey of 557 Paediatric Dentists in the US, 92% felt that parental styles have changed in a negative, less authoritarian or boundary setting way in favour of bribing the children, accepting the childs disrespect and being over-protective. 85% believed that this change in parenting style was directly attributed to significantly worse patient behaviour during dental appointments (Casamassimo et al., 2002). These changes resulted to an increased presence of parents in the surgery (64%), increased number of sedations (38%) and significant decrease in the use of restraint and HOM (56-82%).

Several other societal and parental factors attributed to modern shifts in the behavioural management paradigm have been suggested by Strange, including; higher expectations for health care dollar and experience, lower level of professional expectation for behaviour compliance, a diminishing respect within society for authority, a growing lack of trust in professionals, propensity of legal action, higher expectation for pain-free and positive child experiences, growing sense of parental importance and a distain for use of physical force as well as the modern belief that medication and same day surgery are preferred forms of medical management (Strange, 2014).

We must also take into account these trends when we consider the prior dental experience of parents, and how this may affect their consent to BMT's for their children. The study by Eaton and colleagues clearly shows that the parental attitudes towards aversive techniques was largely negative, and pharmacological options were significantly favoured with Nitrous Oxide sedation and General Anaesthesia 2nd and 3rd most appropriate for of management where simple non-pharmacological BMT's were not successful (Eaton, 2005). It is possible that these beliefs are resultant of past dental experience of aversive or traumatic techniques used for provision of dental care to the parents themselves.

Research and legislation:

During the last decade, significant attention has been given to the association of procedural anaesthesia and neuroanatomical development. Two large trials, GAS (General Anaesthesia vs Spinal Anaesthesia) and PANDA (Pediatric Anesthesia and Neurodevelopment Assessment), revealed that brief, single exposure procedures were not significantly associated with poorer neurodevelopmental outcomes (Davidson et al., 2016; Sun et al., 2016).

Additional data should be expected in the form of the Mayo Anaesthesia Safety in Kids report, which is currently under way. Following the review of these clinical trials and experimental evidence, the FDA released a drug safety communication in December 2016, warning against the use of general anaesthesia and sedation drugs in children younger than 3 years of age, as well as advising practitioners to avoid unneccesarry repeat exposure (FDA, 2016). The warning primarily affects GABA and NMDA agonists commonly used in GA's and sedation procedures; sevofluorane, ketamine and benzodiazapines – affecting the decision making for provision of care under DGA as well as conscious sedation in this age group.

Techniques used in the US, particularly providing deep sedation and general anaesthesia in the office setting, are not permitted in the UK or Australia. In the United States, where poly-pharmacy is commonly practised, there have been 44 deaths associated with dental anaesthesia or sedation between 1980 and 2011. More than half were children aged 2-5 years old. This emphasises the importance of the strict regulation of practitioners involved in providing sedation or general anaesthesia to patients locally (O'Halloran, 2013).

In Australia, practitioners planning to provide conscious sedation must meet all requirements to be approved by the Board and Australian and New Zealand College of Anaesthetists (ANZCA). To gain Dental Board of Australia standard of endorsement, the dentist must hold post-graduate diploma qualifications and is limited to providing conscious sedations (DBA, 2015). The ANZCA PS09 Guidelines on sedation for dental procedures are available from the Australian and New Zealand College of Anaesthetists, and state that IV sedation is only permitted for dentists with appropriate training including advanced paediatric life support, and must be assisted by a registered nurse.

Our consideration of the acceptability of behavioural management techniques was not reported until early studies into parental acceptance to common methods in the 1980's. No better documentation of the profound shift in parental attitudes about behaviour guidance techniques exists than in the collected works exploring the parental opinion about specific techniques in studies using similar and often identical visual recorded demonstrations (Murphy et al., 1984; Lawrence et al., 1991; Eaton et al., 2004).

With changing trends of societal acceptability, parental influence in relation to engagement in their children's healthcare and willingness to consent to medical treatment, and external unquantifiable influences such as policy and regulation, insurance bodies and litigation, the paediatric dentist has had to evolve their approach

to behavioural management in order to accommodate these changes.

Recent exploration into the neurocognitive effects as well as previous reports of mortality following DGA provided by general practitioners in non-hospital settings have led to global reduction into the recommended use of DGA for routine care. From FDA warning to national clinical guidelines in the UK, practitioners are more commonly electing to use procedural sedation as an alternative treatment method. The large variation in definition and regulation of conscious sedation globally results in a large variation of application, such as seen in that compared to countries like the US and UK, general anaesthesia for dental treatment continues to be favoured in Australia.

Conclusion:

We can see that in general, it is evident that the use of aversive techniques has fallen out of favour in Paediatric dentistry. The modern approach to parenting, combined with accessibility for advanced training and the increasing availability of specialized care, particularly in developed countries such as Australia, has resulted in the increasing trends favouring a pharmacological approach of behavioural management. Although these modern approaches allow for a more varied approach to behavioural management in the clinical setting, it is important to consider that traditional approaches focusing on positive communication and rapport building are still maintained as the most favoured forms of BMT by patients, parents and clinicians alike.

References:

American Dental Association, Survey Center. Quarterly survey of dental practice: Special topics. Nitrous Oxide Usage 1994. Chicago: American Dental Association; 1995.

Adair SM, Waller JL, Schafer TE, Rockman RA. A Survey of Members of the American Academy of Periatric Dentstry on Their Use of Behavior Management Techniques. Pediatr Dent 2004;26:159-166.

Association of Pedodontic Diplomates. Technique for behavior management—A survey. J Dent Child. 1972;39:268-272.

Alcaino E, Kilpatrick NM, Kingsford-Smith ED. Utilization of day stay general anaesthesia for the provision of dental treatment to children in New South Wales, Australia. IJPD 2000;10:206-212.

Casamassimo PS, Wilson S, Gross L. Effects of changing US parenting styles on dental practise: perceptions of diplomates of the American Board of Pediatric Dentistry. Pediatr Dent 2002;24:18-22.

Crossley M, Joshi G. An investigation of paediatric dentists' attitudes towards parental accompaniment and behavioural management techniques in the UK. BDJ 2002;192(9):517-521.

Davies EB, Buchanan H. An exploratory study investigating children's perceptions of dental behavioural management techniques. IJPD 2013;23(4):297-309.

Davies C, Harrison M, Roberts G. UK national clinical guidelines in paediatric dentistry: guideline for the use of general anaesthesia (GA) in paediatric dentistry. London: Royal College of Surgeons of England, 2008.

Davidson AJ, Disma N, de Graaff JC et al. Neurodevelopmental outcome at 2 years of age after general anaesthesia and awake-regional anaesthesia in infancy (GAS_: an international multicentre randomised controlled trial. Lancet 2016;387:239-250

Dental Board of Australia. Registration standard for endorsement in relation to conscious sedation. Melbourne: 2013.Dental Board of Australia. Available online: accessed 12 March 2018.

Department of Health (UK). A Conscious Decision: A review of the use of general anaesthesia and conscious sedation in primary dental care. 1 July 2000.

Eaton JJ, McTigue DJ, Fields HW, Beck FM. Attitudes of Contemporary Parents toward Behavior Management Techniques Used in Pediatric Dentistry. Paed Dent 2005;27(2):107-115.

Feigal RJ. Guiding and Managing the Child Dental Patient: A Fresh Look at Old Pedagogy. J Dent Ed, 2001(Dec):1369-1375.

Jamieson LM, Roberts-Thomson KF. Dental general anaesthetic trends among Australian children. BMC Oral Health 2006;6(16):1-7.

Kantaputra, P., K. Chiewcharnvalijkit, K. Wairatpanich et al. Children's attitudes toward behaviour management techniques used by dentists. J Dent Child 2007;74(1):4-9.

Levy RL, Domoto PK. Current techniques for behavior management: A survey. Pediatr Dent. 1979;1:160-164.

Lourenco-Matharu L, Roberts GJ. Oral sedation for dental treatment in young children in a hospital setting. BDJ 2010;209(E12):1-6.

Machen JB. Parental acceptance of paediatric dentistry behaviour management techniques. Ped Dent 1984;6(4):193.

O'Halloran, M. The use of anaesthetic agents to provide anxiolysis and sedation in dentistry and oral surgery. AMJ 2013, 6, 12, 713-718.

Oliver K, Manton DJ. Contemporary behaviour management techniques in clinical pediatric dentistry: out with the old and in with the new?. J Dent Child 2015;82(1):22-28.

Peretz B, Glaicher H, Ram D. Child-management techniques. Are there differences in the way female and male pediatric dentists in Israel practice? Braz Dent J 2003; 14: 82-6.

Peretz B, Kharouba J, Blumer S. Pattern of parental acceptance of management techniques used in pediatric dentistry. J Clin Paed Dent 2013;38(1):27-32.

Robertson S, Ni Chaollai A, Dyer TA. What do we really know about UK paediatric dental general anaesthesia services? BDJ 2012;212(4):165-170

Strange DM. The Evolution of Behavior Guidance: A History of Professional, Practice, Corporate and Societal Influences. Pediatr Dent 2014:36:128-131

Sun LS, Li G, Miller TL et al. Association between a single general anesthesia exposure before age 36 months and neurocognitive outcomes in later childhood. JAMA 2016;315:2312-2320

Wilson S. A survey of the American Academy of Pediatric dentistry membership: Nitrous oxide and sedation. Pediatr Dent 1996;18:87-93.

Wilson S, Alcaino E. Survey on sedation in paediatric dentistry: a global perspective. IFPD 2011;21:231-332.

Wilson S, Gosnell ES. Survey of American Academy of Pediatric Dentistry on Nitrous Oxide and Sedation: 20 years later. Pediatr Dent 2016;38(5):385-392.

Wright FA, Giebartowski JE, McMurray NE. A national survey of dentists' management of children with anxiety or behavior problems. Aust Dent J 1991; 36: 378-83.

Wright FA, McMurray NE, Giebartowski J. Strategies used by dentists in Victoria, Australia, to manage children with anxiety or behavior problems. J Dent Child 1991;58:223-8.

ANZSPD President's Report

Dr Sue Taji

Within our field, the oral health of children can be considered on the local, national, regional and international level. As clinicians, we strive to do the best we can for all the patients we see. In doing so, we are often heavily focused on our own patients that we assist. The more years we spend doing so, the less we look left and right to consider the bigger picture.

When we attend events, meet our colleagues and peers and hear from those who have made great contributions to the field and have contributed to the progression of underlying concepts, strategies and ideas, we broaden our own horizon and receive valuable updates of the bigger picture and how this may apply to ourselves, what we do and how we manage the patients we see on a day to day and week to week basis.

The ANZSPD Biennial held earlier this year brought together colleagues from across Australia and New Zealand to enjoy a few days of late summer warmth on the Gold Coast and saw national and international experts provide their views and opinions.

Behind the scenes there are many that are putting extensive time and efforts into the ANZSPD's RK Hall Lecture Series that will be held in Perth in March 2019. I encourage all members to consider attending what is sure to be an excellent event. Such opportunities to consider the bigger picture are invaluable.

Presidential duties will take me to Bangkok, Thailand, in early November for the International Association of Paediatric Dentistry's Global Summit on Early Childhood Caries. ANZSPD has been a member society of the IAPD for quite some time and Presidents from other member societies across the globe have been invited to meet and discuss and develop a global strategy for ECC. This is the first such Global Summit on ECC that IAPD has organised and it is certain to provide an abundance of ideas and concepts as well as future directions. With such input from around the world, each will bring their own thoughts, experiences and concepts towards discussing strategies to manage what is a global problem. As clinicians, all of us are very much in the frontline in its management and well aware that for a patient's dentition to last their lifetime, so much value is placed on ensuring a favourable start in the early years. From the ANZ region, Emeritus Professor Kim Seow will be amongst the expert group of international presenters due to present at this upcoming event.

Back to the present time and with the colder months upon us, one quickly comes to the realisation that the year is past the halfway mark and is quickly passing us by. We are all busy in our lives and our daily preoccupations and commitments which see to it that one year flows into the next. The more focused we are on what we do, the less we tend to step back to consider the bigger picture. Its nice, from time to time, to get a few moments to consider the bigger picture and I encourage all to do so when an opportunity presents itself.

The Australian and New Zealand Society of Paediatric Dentistry SA Branch Scholarship

Last year saw the introduction and awarding of the first Australian and New Zealand Society of Paediatric Dentistry SA Branch Scholarship. The scholarship has been introduced to provide an opportunity for undergraduate students and recently graduated dentists and oral health therapists to further develop their knowledge and skills in the field of paediatric dentistry.

It is aimed to support research in the area of paediatric dentistry and support community projects and volunteer dental work both locally and abroad that will provide services to communities in need.

The inaugural winner was Dr Ashika Lathif who used the funds from the scholarship to aid her in the completion of her honours project titled; Indigenous children of Australia: dental decay frequency and risk factors. The knowledge and experience gained by Dr Lathif was shared among our members and local paediatric dental community at the recent Postgraduate Case Presentation Competition dinner meeting. Dr Lathif is in the final stages of completion of her project and we wish her every success in the publication and sharing of her research with the broader dental community in the near future. We did not receive a suitable applicant in 2018 but hope to have another successful scholarship application in 2019.

For those that may be interested applying for in the Australian and New Zealand Society of Paediatric Dentistry SA Branch Research Scholarship in 2019, the eligibility criteria is listed below and applications open on March 1st 2019.

ANZSPD SA BRANCH SCHOLARSHIP ELIGIBILITY CRITERIA

- Current member of the ANZSPD SA Branch
- Recently graduated Dentist, Dental Therapist or enrolled as a full time Dental Student that at the completion of your current degree will graduate with a Bachelor of Dental Surgery or Bachelor of Oral Health degree
- Complete the "Project Summary" application form (available from the website)

***Recently graduated student refers to a dentist or oral health therapist that has graduated from their respective degree in the last 10 years*

The oral biofilm in paediatric patients

The oral microbiome is one of the most complex in the human body (Huttenhower et al. 2012). The oral microbiome includes a diverse community of adhering microorganisms, embedded in a self-produced matrix of extracellular polymeric substance and possessing a complex, spatially heterogenous and dynamic structure. Recent technologies have changed the concept of microbiology where large-scale genome analysis and sequencing is now available. Previously it was thought the oral cavity had 700 species however today with genome analysis, it has been shown that there may be 19,000 phylotypes (Keijser et al. 2008). These microorganisms and their interrelationships in the oral environment constitutes the balance between health and disease, such as dental caries or periodontal disease. When the communities live in harmony this is symbiosis with the host, but when the symbiotic relationship shifts the balance it may cause disease (dysbiosis). Thus the presence of disease there is a shift of regular low conditions of low pH (<5.5) in the biofilm, due to altered diet or reduced salivary flow, as a result favours the growth and metabolism of acidogenic or aciduric bacteria increasing risk of disease (Wade 2002).

The oral microbiota therefore provides major benefits to the host including:

1) Colonisation resistance
2) Down-regulate potentially damaging host inflammatory responses
3) Active contributions to the normal development of the physiology of the mouth & host defences

Dental plaque and biofilm forms in an ordered sequence of events where early colonisers attach to the acquired pellicle that absorbs immediately to the tooth surface (Marsh 2016). Early colonisers grow and modifies the environment making it more suitable for later bacteria, many of which will be anaerobic. Those organisms attached will synthesise exopolymers e.g. glucans, which forms the matrix for the biofilm and acts as a scaffold. This is biologically active and able to retain molecules within plaque. Overtime a thick biofilm eventually develops which is composed of a diverse community of interacting organisms and this becomes stable over time (microbial homeostasis) (Marsh 2004).

The new born may be colonised by initial inoculation however only a subgroup will lead to permanent colonisation which will subsequently lead to a more complex and stable into adulthood (Grölund et al. 1999). Below, there will be a discussion on the timing of colonisation of the oral microbiome, when it this may change in a paediatric patient, the types of microorganisms involved such as bacteria, fungi, parasites and viruses and the modes of transmission. Following this, there also be a discussion on the management of the oral biofilm and the use of probiotics to prevent the shift towards dental disease and to ensure oral health.

Colonisation and changes of the oral biofilm in the paediatric patient

Colonising bacteria can be from a maternal origin in a new born which is a type of vertical transmission. The type of delivery, eutocic or dystocic may affect the type of microorganism the new born is first exposed to (Dominguez-Bello et al. 2010). For example babies born by vaginal birth have similar bacterial communities to that of the mother's vaginal bacteria predominantly *Lactobacillus*, *Prevotella*, and *Sneathia* compared to babies born by Caesarean section (dystocic) have bacterial communities similar to that of the mother's skin, predominantly *Staphylococcus*, *Corynebacterium*, and *Propionbacterium* (*Dominguez-Bello et al. 2010*).

The process of permanent colonisation of the oral cavity begins during the first 24-hours of postpartum period of life and will continue to evolve and mature as the child grows with age. This is influenced by the outside world breathing, breastfeeding, contact with parents and medical staff. The most frequent colonisers in the oral cavity include the Gram-positive cocci (Bagg et al. 2006). These microorganisms will begin the change of environment through the production and excretion of their metabolism. For example *Streptoccoccus salivarius* is a commonly found species in the new born, it has the ability to adhere to epithelial cells, as it produces extracellular sucrose, this allows for other bacteria to adhere (Bagg et al. 2006).

With the eruption of teeth, there is a shift in the ecology of microbiota as there are new surfaces for adhesion. Historically it was thought that the cariogenic species of *Streptococcus* began to colonise at this stage due to their preference to adhere to teeth, this was known as the phase of "window of infectivity" (Caufield, Cutter, and Dasanayake 1993). However more recently it these species have been found in the edentulous child highlighting the importance of oral hygiene even before tooth eruption.

By the age of three years of age, the salivary microbiome is already complex but will continue to mature until adulthood (Crielaard et al. 2011). There are differences in the nature of the species during developing dentitions in the deciduous, mixed or permanent dentition. Children in the primary dentition have higher prevalence of *Gammaproteobacteria*, *Pseudomonaceae*, *Enterobacteriacaea*, and *Pasteurellacaeae* (*Crielaard et al. 2011*). As the dentition transitions into a permanent dentition the population of bacteria changes to the *Veillonellaceae*, *Prevotella*.

Puberty is a time of major hormonal change thereby affecting the oral environment. This may lead to an increase in some groups of oral microorganisms including gram negative anaerobes and spirochetes (Lamont 2006). Clinically this manifests as increased incidence of severity of gingivitis during puberty (Mombelli et al. 1989). In addition to this it has been found that as a child grows, the proportion of periodontopathic bacteria also increases thereby changing the ecological system from aerobic or facultative gram-positive cocci to anaerobic fastidious gram-negative bacteria (Tanner et al. 2002).

In addition to the above systemic non-modifiable factors which are involved in the changes of the oral biofilm over time, there are modifiable factors which affect patients during the course of their childhood. These include factors such as diet and prostheses or orthodontic appliances.

Diets which are high in fermentable carbohydrates generally reflect a high level of cariogenic bacteria with a higher incidence of dental caries (Marsh and Bradshaw 1997). Fermentable carbohydrates are of particular significance as this is a substrate that is able to be fermented by oral bacteria and it also used to synthesise extracellular (EPS) and intracellular (IPS) polysaccharides

(Bowen 2002). The consumption of fermentable carbohydrates there for has a three prong effect on the shift to a cariogenic microflora. Firstly when the oral biofilm ferments this substrate the environment induces a low pH shifting to a more cariogenic microflora which are acidogenic and aciduric. EPS created increases bacterial virulence as it changes the infrastructure of the oral biofilm by promoting bacterial adherence to tooth structure (Schilling and Bowen 1992), increases the porosity of the biofilm therefore promoting sugar diffusion (Zero, Van Houte, and Russo 1986) and it has simultaneously been found to reduce concentrations of calcium, phosphorous and fluoride in dental biofilm (Cury, Rebello, and Cury 1997). Finally the presence of IPS provides the microbiome with an endogenous source of carbohydrate during the host fasting period. IPS subsequently results in promoting cariogenic environment by prolonged periods of acid production of the oral microbiome (Zero, Van Houte, and Russo 1986) and maintains a lower fasting pH in the matrix of plaque during periods of nutrient deprivation (Tanzer 1976).

Changes to the oral biofilm may also occur during adolescence where there is an introduction of biomaterials such as prostheses or orthodontic appliances which may change the microbiome (Topaloglu-Ak et al., 2011). This is thought to occur where the appliances can increase plaque retentive site thus impairing mechanical plaque and food removal thereby contributing to dental disease (Øgaard 2008). With the increased retention of the oral microbiome this therefore increases the risk cariogenic and periodontopathic bacteria (Ren et al. 2014). Complications following this may be enamel demineralisation which manifests on a spectrum as a white spot lesion to cavitation upon bracket removal. White spot lesions may occur in 23-90% of patients undergoing orthodontic treatment (Ren et al. 2014) compared to the soft tissue reaction which is less common and transient. The reaction of changes to the oral biofilm to the gingiva may result in a degree of inflammation and the retention sites increases the risk of periodontitis. This of particular significance to mini-screws, micro-implants or mini-plates, as inflammation around these devices is associated to increased 30% failure (Miyawaki et al. 2003).

Constituents of the oral biofilm in the paediatric patient

As discussed above there are various strains of bacteria present in the oral cavity which are cariogenic and periodontopathic. Based on literature reports the major bacterial genera with largest representation in the oral cavity includes *Streptococci*, *Veillonella*, *Granulicatella*, *Gemella*, *Actinomyces*, *Corynebacterium*, *Rothia*, *Fusobacterium*, *Prophyromonas*, *Prevotella*, *Capnocytophaga*, *Neisseria*, *Haemophilus*, *Treponema*, *Lactobacterium*, *Eikenella*, *Leptotrichia*, *Peptostreptococcus*, *Staphylococcus*, *Eubacteria and Propionibacterium* (Zarco, Vess, and Ginsburg 2012). The proportion of these will change with age and the changes in the oral environment. In addition to these, other microorganisms that make up the oral biofilm includes archaea, yeasts, parasites and viruses.

The Archaea are a small minority of the microbiome and restricted to *Methanobrevibacter oralis*, *Methanobacterium curvum/congolense*, and Methanosarcina *Mazei*. These are commensal in healthy individuals but can increase when there is periodontitis. Fungi have been found to colonise on the first day of life and during the first year, *Candidia* colonies may vary between 40-80% of children (Odds 1988). The *Candida* colony will increase with age reaching up to 75% of healthy children (Odds 1988). Candida is therefore a commensal species, however under immune dysfunction such as HIV infection, may become an opportunistic pathogen where its morphology may change from a yeast to hyphal (Calderone and Clancy 2012). The virulence of *Candida* is attributed to its ability to survive in an acidic environment by H+-ATPase, the secretion of organic acids which in turn decreases the pH, *Candida* provides adhesion sites for oral bacteria, in turn *Streptococci* excretes lactate which is a source of carbon for growth for the fungi (Brogden and Guthmiller 2002). In 2010 a study lead by Raja found that in children who had caries had higher frequency of oral *candida* carriage compared to caries-free children (odds ratio of 67.37) (Raja, Hannan, and Ali 2010). Within these results, this group found that there was a higher culture of *Candida* from occlusal surfaces compared to swabs of the buccal mucosa and tongue, thus suggesting a strong affinity of the *Candida* species to carious tooth structure (Raja, Hannan, and Ali 2010). Further to this Yang and colleagues (2012) found children with severe early childhood caries (S-ECC) to have a significantly higher presence of *Candida* albicans of mainly genotype A which transforms into an opportunistic pathogen. Children with S-ECC are more likely to have higher levels of Candida in carious lesions compared to sound tooth surfaces, 57.1% and 14.3% respectively (Yang et al. 2012). Therefore there is evidence where *Candida* contributes to the caries process when there is a shift in the ecology of the oral microbiome especially in instances of S-ECC (Yang et al. 2012).

Historically *Candida* was the first and only fungus found in the oral cavity. However, in 2010, a metagenomic study identified 74 other fungi group have been cultivable and 11 uncultivable ones in the oral cavity of healthy adults (Ghannoum et al. 2010). Currently the role of the mycobiome in the oral cavity is not well understood. There are a few parasites which colonise the oral cavity, the most frequently occurring are *Entamoeba gingivalis* and *Trichomonas Tenax* which are normally non-pathogenic and commensal. Their colonisation is often associated with poor oral hygiene and low socioeconomic status (Bergquist 2009) and are instead more commonly found in adults with periodontal disease. There is a persistent community of double-stranded DNA viruses in the saliva (Pride et al. 2012) and these are almost exclusively identified as bacteriophages. Pride and colleagues (2012) suggests that their role is thought to regulate the microbial diversity of the human cavity.

Location of oral biofilm in the paediatric patient

The complexity of the oral microbiome is also attributable to the different oral habitats available, the variation in oxygen tension, nutrient availability, temperature and host immunological factor exposure (Gizani et al. 2009). Most oral microorganisms will colonise on all habitats including the mucosa, tongue and teeth, but the species may vary as to the proportion on the colonisation size. The biological properties of each habitat will determine which microorganisms can colonise and grow thus the different sites will have destine microorganism profile (Sampaio-Maia and Monteiro-Silva 2014). With respect to *Streptococcus* these are most likely found in the soft tissue, saliva, tongue and supragingival areas. As discussed above *S Salivarius* is in great proportions in the saliva, soft tissue and tongue (Gizani et al. 2009). Gram-negative bacilli are often then

found in the tongue fissures and in the subgingival tooth surfaces. With age it has been noted that the colonisation decreases on epithelial surfaces which has been explained by the improved oral hygiene habits or the maturation of the immune system and levels of IgA secreted (Ben-Aryeh et al. 1990). But due to nature of the oral cavity, it contains different niches for bacterial growth and therefore different bacterial profiles that are site and subject specific.

Transmission of microbiome in the paediatric patient

Oral microorganisms have different origins and therefore various routes of transmission. Vertical transmission from the mother to the child is exemplified by the 80% of new born babies with C Ablicans from their mother's vaginal canal (Blaschke-Hellmessen 1998). There is also proposed transmission whilst breast feeding where bacterial communities of milk typically include oral bacteria such as *Veillonella*, *Prevotella* and *Leptotrichia* suggesting that breastfeeding may provide a significant source of microorganisms. Horizontal transmission can also occur between siblings and/or colleagues (Doméjean et al. 2010). Genotyping of *Streptococcus mutans* in children between 12-30 months attending a day care centre, revealed that 29% of the children had two or more corresponding genotypes, strongly suggesting the occurrence of horizontal transmission within the population (Mattos-Graner et al. 2001).

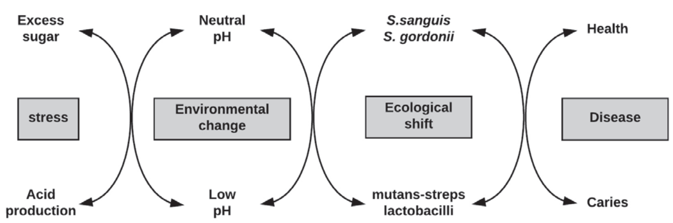
Ecological Plaque Theory

In the presence of disease, there has been a change in the composition of the microbiota (Wade 2013). Plaque overlying carious lesions have been found to have higher proportions of bacteria such as *mutans, streptococci, bifidobacterial* and *lactobacilli.* These species are able to rapidly metabolise dietary sugars to acid and preferentially grow under acidic conditions. In periodontal conditions the overlying biofilm around the gingival margins provokes an inflammatory response. The ecological plaque hypothesis has therefore been used to explain the relationship between resident microbiota and dental disease (Marsh 2003). This theory describes that any major local changes in local environment and these might increase the risk of dental disease. Whereby an increase of sugar intake or reduction of salivary flow may reduce the pH of supragingival biofilm thus selecting for acid-producing and acid-tolerating species at the expense of health associated bacteria. Over time the extended period of time at a low pH value favours the growth of these bacteria and increases the extent of demineralisation of the enamel or dentin (Marsh 2003).

Key drivers of disease includes sugar intake, pathogen metabolism, commensal metabolism and increased bacterial load (Marsh 2003). This is an example of where there is dysbiosis then there will be disease progression thus the management of this is not based directly on targeting key bacterial species.

Resident microbiome in the paediatric patient

The relationship between host and microbiota is dynamic and have evolved over time to have a symbiotic or mutualistic relationship (Chow et al. 2010). The resident oral microbiota provides 'colonisation resistance' where they prevent the establishment of many exogenous microorganisms. Because the residents are attached to the oral surface, established and more efficient with metabolising the available nutrients for growth they inhibit and restrict the growth of potential invaders (Van 2000). There is also 'cross-talking' between microbiota and host cells. For example, *Streptococci* can down-regulate potentially damaging pro-inflammatory host responses to components of the normal oral microbiota such as Gram-negative commensals while the host retains the ability to respond to genuine microbial insults (Srinivasan 2010).



Another example of oral biofilm contributing to gastrointestinal and cardiovascular health is by the metabolism of dietary nitrates (Petersson et al. 2009). This is where 25% of ingested nitrate is secreted into saliva and further reduced to nitrite by oral bacteria. Nitrite goes on to regulate blood flow, blood pressure, gastric integrity and tissue protection against ischaemic injury. When resident salivary microbiota is suppressed then this has been found reduce gastric mucus thickness, fall in blood pressure (Petersson et al., 2009).

Managing the oral biofilm in the paediatric patient

Effective manual plaque remains the central to oral care and prevention of dental diseases, but it may not always be feasible or sufficient for many patients. The biofilm therefore is managed by three-fold: reduce oral biofilm and microbial acid production, prevention of growth of subgingival bacteria and promotion of beneficial bacteria

Reduce microbial acid production:

Reduction of acid production from the microbial fermentation of dietary sugars and the lowering of the pH in dental films has several consequences. Where the acidic conditions will cause demineralisation of hard tissues of the teeth, while the conditions of low pH will select for acidogenic and aciduric bacteria while inhibiting the growth of beneficial species. When it is repeated low pH there is an increased risk of caries.

To reduce microbial acid production mechanical removal of plaque and reduction of fermentable carbohydrate consumption is cornerstone to management of the oral microbiome and therefore dental caries. The manual removal of plaque and bacteria reduces the bacterial load present in the oral cavity, the acid production and therefore the low pH potential of the oral environment. The reduction in quantity and frequency of fermentable carbohydrates deprives the metabolism of cariogenic bacteria by reducing their catabolising of dietary sugars, generating EPS and IPS which are bacterial virulence factors to enhance a cariogenic environment as discussed above.

Additional chemical adjuncts may be used and the limiting the intake of acidogenic or aciduric substances. Agents which may be used to reduce the microbial acid production includes fluoride and sugar alcohols (e.g. xylitol) or intense sweeteners (e.g. aspartame or saccharin). Sugar substitutes such as xylitol or aspartame or saccharin cannot be fermented rapidly into acid by oral bacteria, thereby reducing damage to dental hard tissues and removing the environmental

conditions required for acid-tolerating bacteria (Marsh 2010).

In addition to the prevention of demineralisation and promotion of remineralisation, fluoride is able to inhibit sugar transport and glycolysis (Featherstone et al. 1990). Fluoride is in solution is adsorbed onto the surface of the crystal and can inhibit mineral loss by reducing the dissolution rate due to adsorption of the fluoride ion (Featherstone et al. 1990). Fluoride in plaque fluid or saliva can travel to carious lesions with calcium and phosphate where the fluoride is attracted to the calcium ions within the demineralised crystal remnants and then further attracting more calcium, phosphate and fluoride and so on (Featherstone 2000). This is the putting back of mineral into a carious lesion (Featherstone 2000). Fluoride can enter bacteria when combined with hydrogen (HF) (Bowden and Hamilton 1998). Once inside it can dissociate into free fluoride and hydrogen interfering with several enzyme actions within the cell thereby slowing down or killing the cells (Bowden and Hamilton 1998).

Other antiplaque and antimicrobial agents include; chlorhexidine, essential oils and triclosan. Chlorhexidine is a bisbiguanide and has a broad spectrum of activity against gram-positive and gram-negative bacteria and yeasts. Chlorhexidine can a) affect the sugar transport and acid production in cariogenic *Streptococci*, b) can affect various membrane functions such as inhibiting enzymes which maintain intracellular pH, and finally c) a major protease (gingipain) in periodontal pathogens *Porphyromonas gingivalis*. It has a good substantivity with 30% of chlorhexidine dose retained in the mouth and has been found to reduce plaque, caries and gingivitis (Gunsolley 2010). Alternatively, mouthwashes have essential oils such as menthol, thymol, eucalyptol and methyl salicylate which have also shown to reduce and inhibit Gram-negative anaerobic species in supra- and subgingival plaque and subsequently reduces dental plaque and gingivitis (Stoeken, Paraskevas, and Van Der Weijden 2007). In a systematic review of all mouthwashes, those containing chlorhexidine reduced plaque (by the plaque index) by 40.4% compared to mouthwashes containing essential oils at 27% (Gunsolley 2010) over a period of six months. This review concluded that there was sufficient evidence supporting the use of anti-plaque and anti-gingivitis mouth rinses as adjuncts to current oral hygiene practices. Triclosan will be discussed later in the prevention of subgingival bacterial growth.

As previously described, during orthodontic treatment, there are changes in the oral biofilm. To minimise acid production by the oral microbiome, orthodontics can be addressed by the removal of the intervening appliances, use of fluoride releasing systems in the adhesives (Chin et al. 2009) there has yet to be fluoride applications in any other form such as brackets and wires (Ren et al. 2014).

Advances in nanotechnology has shaped the materials developed to restore these carious lesions, nanoparticles such as metals and antimicrobial polymers have been additions in to restorative materials for an antimicrobial approach to change the environment of the oral microbiome and reduce the microbiome acid production. Below are specific additions to materials which may have antimicrobial activities or remineralisation capabilities:

- **Silver Nanoparticles (NAg):** Silver has a known antimicrobial action by its interaction with bacterial cell membranes by interfering with the peptidoglycan cell walls and plasma membranes (Chaloupka, Malam, and Seifalian 2010). NAg has been found to exhibit antibacterial effects against S Mutans and Lactobacillus spp (Espinosa-Cristóbal et al. 2012). The use of these in restorative materials composite resins, dental primers and adhesives, therefore prevents bacterial DNA replication and thus cellular replication.
- **Zinc Oxide Nanoparticles (NZn):** These have also demonstrated antibacterial effects against gram negative and gram positive bacteria (Jones et al. 2008). NZn antimicrobial mechanisms including the ability to modify cell membrane activity and oxidative stress by generating H2O2 (Xie et al. 2011) and the leaching of zinc into the biofilm causes affects bacterial metabolism of sugar and the enzymatic activity of the overall biofilm (Gu et al. 2012).
- **Quaternary Ammonium Polyethylenimine Nanoparticles (QAS-PEI):** The addition of QAS-PEI in composite resin has been found to exhibit immediate and strong antibacterial effect against S Mutans sustained over one month without leaching (Yudovin-Farber et al. 2010). The antimicrobial mechanism is yet to be established but proposed that QAS materials cause bacterial lysis by binding to the cell membrane and subsequently results in cytoplasmic leakage (Yudovin-Farber et al. 2010).
- **Calcium Phosphate Nanoparticles:** Soluble calcium phosphate phases have been developed to release calcium and phosphate ions increasing the mineral content of the carious lesion (Zhou and Bhaduri 2012). Amorphous calcium phosphate (ACP) in particular can easily transform into crystalline phases and its presence in materials such as composite resins allows for the continuous release of calcium and phosphate ions (Xu et al. 2011). As these ions diffuse out of the interior of the resin it may create a high local concentration at the surface with the tooth thus stimulating the deposition of apatite material(Xu et al. 2011).
- **Calcium Fluoride Nanoparticles:** Unfortunately, it has been found that materials with high fluoride release generally have poorer mechanical properties in order to address these advances have included the addition of calcium to the nanoparticle to composite resins and glass ionomer materials. Fluoride release in a cariogenic (pH <5.5) environment has been found to inhibit caries without compromising the long-term mechanical properties (Weir et al. 2012).
- **Nanohydroxyapatite (HA) and Nanofluorohydroxyapatite:** Synthetics hydroxyapatite (HA) is a biologically compatible material that has been considered a natural mineral constituent of dentine. Nano-HA has been incorporated into RMGIC (Goenka, Balu, and Sampath Kumar 2012) increasing the resistance to demineralisation while still providing acceptable bonding strength and mechanical properties.

Prevention of subgingival bacterial growth:

The majority of bacteria associated with periodontal disease are both obligatory anaerobic and proteolytic. The growth of these microbiota is dependent on the plentiful supply of essential nutrients (proteins, peptides) and cofactors such as haemin and low redox potential. For example, it has been found the Triclosan, which is included in many dentifrices and mouth washes, is an antimicrobial, anti-metabolic (inhibitory to bacterial sugar metabolism and protease activity) and anti-inflammatory (Barros et al. 2010). Triclosan therefore provides a broad spectrum of antimicrobial activity where the half-life for clearance of triclosan is improved with the addition of zinc e.g. triclosan 20 minutes compared to zinc and triclosan for 45 minutes (Cummins and Creeth 1992).

Promotion of beneficial bacteria:

Restricting the growth of opportunistic microbiome also decreases the risk of damage to host tissue but also maintains conditions that are favourable for beneficial oral bacteria. Additional approaches to improving the growth of resident microbiota are being developed (Devine and Marsh 2009) which includes the use of pre- and probiotics.

Probiotics are defined as viable microorganisms that confer health benefit when administered in sufficient doses (Reid et al. 2003). These are organisms which have been claimed to have beneficial effects such as *lactobacilli*, and *bifidobacterial*. The mechanisms of action for probiotics have been summarised and includes (Devine and Marsh 2009; Reid et al. 2003):

1) Prevention of adhesion of pathogens to host tissues
2) Stimulation and modulation of the mucosal immune system e.g. by reducing production of pro-inflammatory cytokines it increases the production of anti-flammatory cytokines e.g. IL-10 and thereby enhancing IgA defences and influences dendritic cell maturation.
3) Modulation of cell proliferation and apoptosis through cell responses e.g. microbially produced short chain fatty acids
4) Improvement of intestinal barrier integrity and up-regulation of mucin production
5) Killing or inhibition of growth pathogens through production of bacteriocins or other products such as acid or peroxide which are antagonistic towards pathogenic bacteria

However, the use of probiotics for an oral application remains to be a contentious area as most strains being used (lactobacilli or bifidobacterial) have implications within the caries process. A systematic review on the probiotic strains in caries prevention has been completed in 2013 lead by Cagetti. Where only 23 randomised clinical trials assessing *in vivo* probiotics met the groups inclusion criteria with 11 studies assessing the administration of trials on children and the levels of *s mutans* following the study. Most common strains of bacteria used were *L rhamnosus* in milk or yoghurt vehicles. Three trials have been published by using milk and *L rhamnosus*. These studies administered the probiotic to preschool children and managed to show a significant reduction of caries increment in the probiotic milk group after seven months compared to the control (Näse et al. 2001). An RCT by Stecksen-Blicks (2009) reviewed probiotics over 21 months and found that there was a dramatic reduction in early childhood caries when using probiotic milk and 2.5ppm fluoride however the effect of the two agents could not be distinguished (Stecksén-Blicks, Sjöström, and Twetman 2009). Yoghurts with *L rhamnosus* were given to children over a period of three weeks, there was a significant decrease of *S mutans* immediately after the probiotic was taken however after five weeks there was no difference between the groups (Aminabadi et al. 2011). However overall the sample sizes were small and review period were short, no statistical differences were noted between subjects receiving the probiotic milk compared to the control (Cagetti et al. 2013). The review concluded that there were promising results from the selected trials however the effect is short-lasting, in addition to this, the above discussion alludes to *S mutans* to not be the sole cariogenic bacteria involved to the caries process and should therefore not be the only measure for probiotic studies (Cagetti et al. 2013). Twetman also summarised in 2012 that the published data for probiotics may have a publication bias with an overrepresentation of positive findings. The challenges with administering these is that it requires regular intakes (4-5 days of the week) which in turn challenges patient compliance and costs. Furthermore most of the studies completed thus far are of short-term trials and the short-term reduction of *S mutans* may not necessarily be associated with less caries development or reduced caries risk (Twetman 2012).

Prebiotics selectively promotes the growth of beneficial oral bacteria and the development of functional foods that would have a potentially positive effect on oral health beyond basic nutrition. It is therefore thought that the major mechanism of prebiotics is to be indirect (Gibson, McCartney, and Rastall 2005), for example by facilitating the proliferation of beneficial components of the resident microflora with probiotic effects resulting from the actions of bacteria. Examples of prebiotics includes inulin-type fructans, maltodextrin, fructooligosaccharides and galactooligosaccharides. These are defined as non-digestible oligosaccharides that affect the proliferation of resident commensal bacteria that may then exert probiotic effects (Roberfroid 2007). Oligosaccharides derivatives contain sugars that are specific epithelial cell receptors to which pathogens adhere and thus provide a 'decoy' adhesion site and cause pathogens to adhere to luminal contents rather than epithelial cells (Gibson, McCartney, and Rastall 2005). Other types of prebiotics includes selectively fermented ingredients that allow specific changes in the composition and/or activity of the resident microflora that confer benefits upon host well-being and health (Roberfroid 2007).

Although the use of probiotics and prebiotics are considered safe and there have been no reported adverse effects, it cannot be used a panacea for the management of biofilm in paediatric dentistry. must be used with careful consideration as most of the evidence has been focused on gastrointestinal microbiota and there has been little work done in regards to the oral cavity (Devine and Marsh 2009). Furthermore there are no protocols, no evidence based recommended doses or duration of pre- or probiotics.

References:

Aminabadi, N. A., L. Erfanparast, A. Ebrahimi, and S. G. Oskouei. 2011. 'Effect of Chlorhexidine Pretreatment on the Stability of Salivary Lactobacilli Probiotic in Six- to Twelve-Year-Old Children: A Randomized Controlled Trial', Caries Research, 45: 148-54.

Bagg, Jeremy, T Wallace MacFarlane, Ian R Poxton, and Andrew J Smith. 2006. Essentials of microbiology for dental students (Oxford university press).

Barros, Silvana P., Sodsi Wirojchanasak, David A. Barrow, Fotinos S. Panagakos, William Devizio, and Steven Offenbacher. 2010. 'Triclosan inhibition of acute and chronic inflammatory gene pathways', Journal of clinical periodontology, 37: 412-18.

Ben-Aryeh, H, M Fisher, R Szargel, and D Laufer. 1990. 'Composition of whole unstimulated saliva of healthy children: changes with age', Archives of Oral Biology, 35: 929-31.

Bergquist, R. 2009. 'Parasitic infections affecting the oral cavity', Periodontol 2000, 49: 96-105.

Blaschke-Hellmessen, Renate. 1998. 'Subpartale Übertragung von Candida und ihre Konsequenzen: Subpartal transmission of Candida and its consequences', Mycoses, 41: 31-36.

Bowden, George HW, and Ian R Hamilton. 1998. 'Survival of oral bacteria', Critical Reviews in Oral Biology & Medicine, 9: 54-85.

Bowen, William H. 2002. 'Do we need to be concerned about dental caries in the coming millennium?', Critical Reviews in Oral Biology & Medicine, 13: 126-31.

Brogden, K. A., and J. M. Guthmiller. 2002. K. A. Brogden and J. M. Guthmiller (eds.), Polymicrobial Diseases (ASM Press
Washington (DC)).

Cagetti, Maria, Stefano Mastroberardino, Egle Milia, Fabio Cocco, Peter Lingström, and Guglielmo Campus. 2013. 'The Use of Probiotic Strains in Caries Prevention: A Systematic Review', Nutrients, 5: 2530.

Calderone, R. A., and C. J. Clancy. 2012. Candida and candidiasis (ASM Press: Washington).

Caufield, PW, GR Cutter, and AP Dasanayake. 1993. 'Initial acquisition of mutans streptococci by infants:

evidence for a discrete window of infectivity', Journal of Dental Research, 72: 37-45.

Chaloupka, Karla, Yogeshkumar Malam, and Alexander M Seifalian. 2010. 'Nanosilver as a new generation of nanoproduct in biomedical applications', Trends in biotechnology, 28: 580-88.

Chin, Mervyn YH, Andrew Sandham, Elena N Rumachik, Jan L Ruben, and Marie-Charlotte DNJM Huysmans. 2009. 'Fluoride release and cariostatic potential of orthodontic adhesives with and without daily fluoride rinsing', American Journal of Orthodontics and Dentofacial Orthopedics, 136: 547-53.

Chow, Janet, S Melanie Lee, Yue Shen, Arya Khosravi, and Sarkis K Mazmanian. 2010. 'Host–bacterial symbiosis in health and disease.' in, Advances in immunology (Elsevier).

Crielaard, Wim, Egija Zaura, Annemarie A Schuller, Susan M Huse, Roy C Montijn, and Bart JF Keijser. 2011. 'Exploring the oral microbiota of children at various developmental stages of their dentition in the relation to their oral health', BMC medical genomics, 4: 22.

Cummins, D., and J. E. Creeth. 1992. 'Delivery of Antiplaque Agents from Dentifrices, Gels, and Mouthwashes', Journal of Dental Research, 71: 1439-49.

Cury, JA, MAB Rebello, and AA Del Bel Cury. 1997. 'In situ relationship between sucrose exposure and the composition of dental plaque', Caries Research, 31: 356-60.

Devine, Deirdre A., and Philip D. Marsh. 2009. 'Prospects for the development of probiotics and prebiotics for oral applications', Journal of Oral Microbiology, 1.

Doméjean, S, L Zhan, PK DenBesten, J Stamper, WT Boyce, and JD Featherstone. 2010. 'Horizontal transmission of mutans streptococci in children', Journal of Dental Research, 89: 51-55.

Dominguez-Bello, Maria G, Elizabeth K Costello, Monica Contreras, Magda Magris, Glida Hidalgo, Noah Fierer, and Rob Knight. 2010. 'Delivery mode shapes the acquisition and structure of the initial microbiota across multiple body habitats in newborns', Proceedings of the National Academy of Sciences, 107: 11971-75.

Espinosa-Cristóbal, LF, GA Martínez-Castañón, RE Martínez-Martínez, JP Loyola-Rodríguez, N Patiño-Marín, JF Reyes-Macías, and Facundo Ruiz. 2012. 'Antimicrobial sensibility of Streptococcus mutans serotypes to silver nanoparticles', Materials Science and Engineering: C, 32: 896-901.

Featherstone, JDB, R Glena, M Shariati, and CP Shields. 1990. 'Dependence of in vitro demineralization of apatite and remineralization of dental enamel on fluoride concentration', Journal of Dental Research, 69: 620-25.

Featherstone, John D. B. 2000. 'THE SCIENCE AND PRACTICE OF CARIES PREVENTION', The Journal of the American Dental Association, 131: 887-99.

Ghannoum, Mahmoud A, Richard J Jurevic, Pranab K Mukherjee, Fan Cui, Masoumeh Sikaroodi, Ammar Naqvi, and Patrick M Gillevet. 2010. 'Characterization of the oral fungal microbiome (mycobiome) in healthy individuals', PLoS pathogens, 6: e1000713.

Gibson, G. R., A. L. McCartney, and R. A. Rastall. 2005. 'Prebiotics and resistance to gastrointestinal infections', The British journal of nutrition, 93 Suppl 1: S31.

Gizani, Sotiria, William Papaioannou, Anne D Haffajee, Katerina Kavvadia, Marc Quirynen, and Liza Papagiannoulis. 2009. 'Distribution of selected cariogenic bacteria in five different intra-oral habitats in young children', International Journal of Paediatric Dentistry, 19: 193-200.

Goenka, Sumit, Rajkamal Balu, and T. S. Sampath Kumar. 2012. 'Effects of nanocrystalline calcium deficient hydroxyapatite incorporation in glass ionomer cements', Journal of the Mechanical Behavior of Biomedical Materials, 7: 69-76.

Grölund, Minna-Maija, Olli-Pekka Lehtonen, Erkki Eerola, and Pentti Kero. 1999. 'Fecal microflora in healthy infants born by different methods of delivery: permanent changes in intestinal flora after cesarean delivery', Journal of pediatric gastroenterology and nutrition, 28: 19-25.

Gu, Haijing, Danni Fan, Jinlong Gao, Wei Zou, Zhixiang Peng, Ziming Zhao, Junqi Ling, and Racquel Z LeGeros. 2012. 'Effect of ZnCl2 on plaque growth and biofilm vitality', Archives of Oral Biology, 57: 369-75.

Gunsolley, John C. 2010. 'Clinical efficacy of antimicrobial mouthrinses', Journal of Dentistry, 38: S6-S10.

Huttenhower, Curtis, Dirk Gevers, Rob Knight, Sahar Abubucker, Jonathan H Badger, Asif T Chinwalla, Heather H Creasy, Ashlee M Earl, Michael G FitzGerald, and Robert S Fulton. 2012. 'Structure, function and diversity of the healthy human microbiome', Nature, 486: 207.

Jones, Nicole, Binata Ray, Koodali T Ranjit, and Adhar C Manna. 2008. 'Antibacterial activity of ZnO nanoparticle suspensions on a broad spectrum of microorganisms', FEMS microbiology letters, 279: 71-76.

Keijser, BJF, E Zaura, SM Huse, JMBM Van der Vossen, FHJ Schuren, RC Montijn, JM Ten Cate, and W Crielaard. 2008. 'Pyrosequencing analysis of the oral microflora of healthy adults', Journal of Dental Research, 87: 1016-20.

Lamont, Richard J. 2006. Oral microbiology and immunology (ASM Press: Washington, D.C.).

Marsh, P. D. 2004. 'Dental Plaque as a Microbial Biofilm', Caries Research, 38: 204-11.

Marsh, PD. 2010. 'Controlling the oral biofilm with antimicrobials', Journal of Dentistry, 38: S11-S15. 2016. 'Dental biofilms in health and disease.' in, Understanding Dental Caries (Springer).

Marsh, Philip D, and David J Bradshaw. 1997. 'Physiological approaches to the control of oral biofilms', Advances in Dental Research, 11: 176-85.

Marsh, Phillip D. 2003. 'Are dental diseases examples of ecological catastrophes?', Microbiology, 149: 279-94.

Mattos-Graner, Renata O, Yihong Li, Page W Caufield, Margaret Duncan, and Daniel J Smith. 2001. 'Genotypic diversity of mutans streptococci in Brazilian nursery children suggests horizontal transmission', Journal of Clinical Microbiology, 39: 2313-16.

Miyawaki, Shouichi, Isao Koyama, Masahide Inoue, Katsuaki Mishima, Toshio Sugahara, and Teruko Takano-Yamamoto. 2003. 'Factors associated with the stability of titanium screws placed in the posterior region for orthodontic anchorage', American Journal of Orthodontics and Dentofacial Orthopedics, 124: 373-78.

Mombelli, A, FA Gusberti, MAC Van Oosten, and NP Lang. 1989. 'Gingival health and gingivitis development during puberty: A 4-year longitudinal study', Journal of clinical periodontology, 16: 451-56.

Näse, L., K. Hatakka, E. Savilahti, M. Saxelin, A. Pönkä, T. Poussa, R. Korpela, and J. H. Meurman. 2001. 'Effect of Long–Term Consumption of a Probiotic Bacterium, Lactobacillus rhamnosus GG, in Milk on Dental Caries and Caries Risk in Children', Caries Research, 35: 412-20.

Odds, F. C. 1988. Candida and candidosis: a review and bibliography. 2nd edition (Baillière Tindall: London).

Øgaard, Bjørn. 2008. ''White spot lesions during orthodontic treatment: mechanisms and fluoride preventive aspects.'' In Seminars in Orthodontics, 183-93. Elsevier.

Petersson, Joel, Mattias Carlström, Olof Schreiber, Mia Phillipson, Gustaf Christoffersson, Annika Jägare, Stefan Roos, Emmelie Å Jansson, A Erik G Persson, and Jon O Lundberg. 2009. 'Gastroprotective and blood pressure lowering effects of dietary nitrate are abolished by an antiseptic mouthwash', Free Radical Biology and Medicine, 46: 1068-75.

Pride, David T, Julia Salzman, Matthew Haynes, Forest Rohwer, Clara Davis-Long, Richard A White III, Peter Loomer, Gary C Armitage, and David A Relman. 2012. 'Evidence of a robust resident bacteriophage population revealed through analysis of the human salivary virome', The ISME journal, 6: 915.

Raja, M., A. Hannan, and K. Ali. 2010. 'Association of oral candidal carriage with dental caries in children', Caries Res, 44: 272-6.

Reid, Gregor, Jana M Jass, Tom Sebulsky, and John K McCormick. 2003. 'Potential Uses of Probiotics in Clinical Practice', Clinical Microbiology Reviews, 16: 658.

Ren, Yijin, Marije A Jongsma, Li Mei, Henny C van der Mei, and Henk J Busscher. 2014. 'Orthodontic treatment with fixed appliances and biofilm formation—a potential public health threat?', Clinical Oral Investigations, 18: 1711-18.

Roberfroid, Marcel. 2007. 'Prebiotics: the concept revisited.(Author abstract)', The Journal of Nutrition, 137: 830S.

Sampaio-Maia, Benedita, and Filipa Monteiro-Silva. 2014. 'Acquisition and maturation of oral microbiome throughout childhood: an update', Dental research journal, 11: 291.

Schilling, KURT M, and WILLIAM H Bowen. 1992. 'Glucans synthesized in situ in experimental salivary pellicle function as specific binding sites for Streptococcus mutans', Infection and immunity, 60: 284-95.

Srinivasan, Naren. 2010. 'Telling apart friend from foe: discriminating between commensals and pathogens at mucosal sites', Innate immunity, 16: 391-404.

Stecksén-Blicks, C., I. Sjöström, and S. Twetman. 2009. 'Effect of Long-Term Consumption of Milk Supplemented with Probiotic Lactobacilli and Fluoride on Dental Caries and General Health in Preschool Children: A Cluster-Randomized Study', Caries Research, 43: 374-81.

Stoeken, Judith E, Spiros Paraskevas, and Godefridus A Van Der Weijden. 2007. 'The long-term effect of a mouthrinse containing essential oils on dental plaque and gingivitis: a systematic review', Journal of periodontology, 78: 1218-28.

Tanner, Anne CR, PM Milgrom, R Kent Jr, SA Mokeem, RC Page, SIA Liao, CA Riedy, and JB Bruss. 2002. 'Similarity of the oral microbiota of pre-school children with that of their caregivers in a population-based study', Oral Microbiology and Immunology, 17: 379-87.

Tanzer, JM. 1976. 'Association of Streptococcus mutans virulence with synthesis of intracellular polysaccharide', Proceedings, Microbial aspects of dental caries: 597-616.

Twetman, Svante. 2012. 'Are we ready for caries prevention through bacteriotherapy?', Brazilian oral research, 26 Suppl 1: 64.

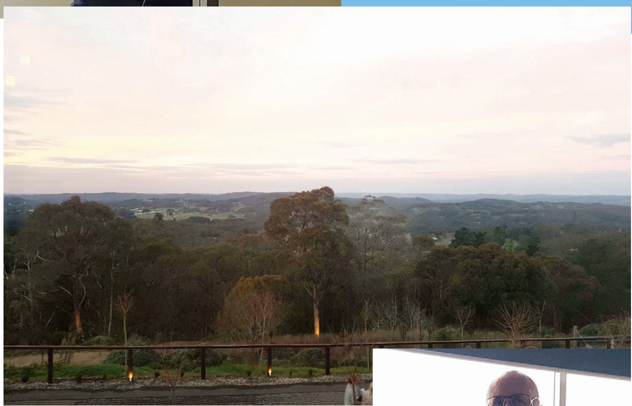
Van, J Eldere. 2000. 'The role of bacteria as a local defence mechanism in the ear, nose and throat', Acta oto-rhino-laryngologica Belgica, 54: 243-47.

Wade, William. 2002. 'Unculturable bacteria—the uncharacterized organisms that cause oral

REFERENCES CONTINUED ON PAGE 14...

ANZSPD SA report

It's been a busy year. 2018 started off with a Partner's Evening at Sprout Kitchen. Members and their partners and friends were treated to by previous Masterchef contestant cook Callum Hann and dietitian Themis Chryssidis.



A two-course meal aimed at increasing awareness of the relationship between food and health helped was tried and tested in the hands-on cooking class. By all accounts, it was a delicious experience!

The second meeting in May treated members and guests to a presentation competition from a medley of postgraduate students from different dental specialities. Students were judged by Emeritus Professor Alastair Goss and Dr Wendy Cheung. The winner of the inaugural ANZSPD SA Branch Postgraduate Case Presentation Competition was Dr Sven Jensen, a third year orthodontic. A People's Choice award was given to Dr Emilija Ports, a first year paediatric dentistry student. Members also heard from the 2017 ANZSPD SA Branch Scholarship winner, Dr Ashika Lathif, who presented her initial results on risk factors and dental caries frequency in Indigenous children.

Our most recent meeting was a Winter in July Scientific day at Mt Loft House in the beautiful Adelaide Hills. The day started off with Associate Professor Richard Widmer discussing the evolution of Paediatric Dentistry and the direction in which the speciality is headed. Handy clinical tips and tricks were also reflected upon. Dr Eduaro Alcaino discussed informed consent in paediatric dentistry and the differences in health law that apply in each state as well as the difficulties in treating children in a medico-legal environment. Sedation techniques, the wish of parents to be present in the surgery and the use of restraint were also addressed, as well as parental concerns of general anaesthesia. A 5-course degustation lunch was also enjoyed by all.

Our last meeting of the year will be in October, looking at the importance of a dental home for children and adolescents with Special Needs and the transition of these patients to adulthood.

I would like to thank the SA Branch committee for their continuous dedication and support.

THE ORAL BIOFILM IN PAEDIATRIC PATIENTS – *References continued from page 13.*

infections', Journal of the Royal Society of Medicine, 95: 81-83.

Wade, William G. 2013. 'The oral microbiome in health and disease', Pharmacological research, 69: 137-43.

Weir, Michael D., Jennifer L. Moreau, Eric D. Levine, Howard E. Strassler, Laurence C. Chow, and Hockin H. K. Xu. 2012. 'Nanocomposite containing CaF2 nanoparticles: Thermal cycling, wear and long-term water-aging', Dental Materials, 28: 642-52.

Xie, Yanping, Yiping He, Peter L Irwin, Tony Jin, and Xianming Shi. 2011. 'Antibacterial activity and mechanism of action of zinc oxide nanoparticles against Campylobacter jejuni', Applied and environmental microbiology, 77: 2325-31.

Xu, Hockin H. K., Jennifer L. Moreau, Limin Sun, and Laurence C. Chow. 2011. 'Nanocomposite containing amorphous calcium phosphate nanoparticles for caries inhibition', Dental Materials, 27: 762-69.

Yang, Xiao Qiong, Qiong Zhang, Li Ying Lu, Ran Yang, Yuan Liu, and Jing Zou. 2012. 'Genotypic distribution of Candida albicans in dental biofilm of Chinese children associated with severe early childhood caries', Archives of Oral Biology, 57: 1048-53.

Yudovin-Farber, Ira, Nurit Beyth, Ervin I Weiss, and Abraham J Domb. 2010. 'Antibacterial effect of composite resins containing quaternary ammonium polyethyleneimine nanoparticles', Journal of Nanoparticle Research, 12: 591-603.

Zarco, MF, TJ Vess, and GS Ginsburg. 2012. 'The oral microbiome in health and disease and the potential impact on personalized dental medicine', Oral Diseases, 18: 109-20.

Zero, DT, J Van Houte, and J Russo. 1986. 'The intra-oral effect on enamel demineralization of extracellular matrix material synthesized from sucrose by Streptococcus mutans', Journal of Dental Research, 65: 918-23.

Zhou, Huan, and Sarit Bhaduri. 2012. 'Novel microwave synthesis of amorphous calcium phosphate nanospheres', Journal of Biomedical Materials Research Part B: Applied Biomaterials, 100: 1142-50.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SA Postgraduate Case Presentations, 2018

Tallan Chew, 2nd year, DClinDent Endodontics, University of Adelaide

Title: Surgical decompression of a large persistent lesion of endodontic Origin

Summary: Apical periodontitis occurs due to the inflammatory reaction of the body towards the presence of microorganisms in the root canal system and their release of endotoxins. In cases with large lesion size, orthograde endodontic management alone may not be sufficient to manage the infection and an additional decompression procedure is required to promote healing. This case presentation demonstrated an alternative minimally invasive procedure for the management of a large persistent lesion of endodontic origin associated with teeth 12, 11 and 21. Following numerous re-dressing appointments, 12, 11 and 21 were not responding to orthograde endodontic treatment; the sinus tract was still present with no obvious signs of resolution of the palatal swelling. One week post-surgical placement of a PVS decompression tube into the lesion for daily irrigation, the palatal swelling subsided. This surgical decompression procedure allowed for the resolution of symptoms and drying of the root canal system for placement of intra-canal medicaments and subsequent obturation. Surgical decompression is an alternative treatment option for individuals with a large lesion where periapical surgery is deemed too invasive, contraindicated or unpredictable.

Marko Milosevic, 3rd year DClinDent Paediatric Dentistry, Adelaide University

Title: Traumacoaster - The Unpredictable Ups and Downs of Dental Trauma

Summary: Managing avulsions can be challenging at the best of times, with considerations given to root maturity, storage medium, extra-oral dry time. Emergency management can affect the viability of the periodontal ligament and survival of the tooth in question. The management of an immature 11 following avulsion in a 6 year old girl was complicated by 5 minutes of dry time, 30 minutes storage in tap water, followed by 90 minutes of milk storage for a total extra-oral time of just over 2 hours. Following flexible splinting for 2 weeks, healing was complicated with pulpal necrosis, ankylosis and infra-occlusion. After root canal treatment with long term dressing with calcium hydroxide, spontaneous resolution of ankylosis, with subsequent re-eruption, as well as continued root development was observed.

Garima Sharma, 3rd year DClinDent Endodontics, University of Adelaide

Title: Orthograde endodontic retreatment and root resection on tooth 46

Summary: Root resection is a surgical procedure in which one or more of the roots of a multi-rooted tooth are removed at the level of the furcation whilst the crown and remaining roots are left in function. This case highlights the management of previously root canal treated lower right first molar, 46 with large periapical radiolucency associated with vertical root fracture in distal root. Orthograde retreatment of mesial canals and root resection of distal root was undertaken. 6 months review revealed clinical and radiographic signs of periapical healing. Buhler 1988 and Carnevale 1998 showed survival rate of around 90% over 7-10year period. Case selection is critical for the long term survival of the tooth, the remaining root should have more than 50% bone support and should carry the lightest occlusal load possible.

Keng Soon Yeoh, 2nd year, Special Needs Dentistry, University of Adelaide

Title: A Case of Ameloblastoma

Summary: Ameloblastoma is a rare, benign, slow-growing but locally invasive neoplasm of odontogenic origin involving mandible and maxilla. It has variable geographic prevalence and with an approximate global incidence of 0.5 cases per million person years. Diagnosis classically established by histology supplemented by computed tomography (CT) and/ or magnetic resonance imaging (MRI). Surgical resection is the current care for ameloblastoma with 1-2cm bone margin and immediate bone reconstruction/ plate to facilitate speech and swallowing. Definite reconstruction requires multiple disciplinary team involvement to achieve better outcome.

Other case presentations given were on the following topics:

"Post-crowns" (Katy McKenna, Prosthodontics), "Full mouth rehabilitation" (Fiza Mughal, Prosthodontics), "Staying alive – a short tail of a tooth" (Lydia Ng, Paediatrics) and the ANZSPD SA Branch Research Scholarship presentation on "Indigenous children of Australia: dental decay frequency and risk factors" (Ashika Latif, recent graduate, University of Adelaide).

ANZSPD SA Branch Post-Graduate **Presentation Winner**

Title: Management of a Permanent Trauma with Delayed Presentation

Dr Sven Jensen,
3rd year DClinDent in Orthodontics,
University of Adelaide

Early intervention orthodontics allows interception of developing malocclusion in the mixed dentition, encourages normal development, is aimed at a short treatment time of 6 – 12 months and does not preclude the need for future orthodontics.(Arvystas 1998) It can be involve treatment of anterior crossbite, posterior crossbite, skeletal class II patients, skeletal class III patients, space loss or impacted teeth. This case describes the management of an 11-year old boy with a history of trauma to his deciduous 61, subsequent extraction and space loss in the area of the 21 (Figure 1).

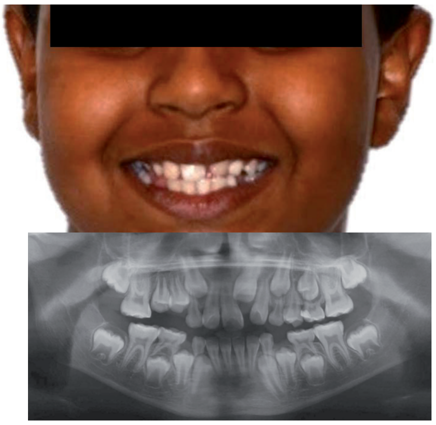


Figure 1. Initial photo and OPG of the patient with impaction and space loss for the developing 21.

The most commonly impacted tooth is the third molar, with a prevalence of 18.97-30.80% (Carter and Worthington 2016), followed by maxillary canine at 0.27-2.4% (Chaushu, Kaczor-Urbanowicz et al. 2015). Maxillary central incisors are less commonly impacted with a prevalence reported at 0.06-0.2% (Fu, Wang et al. 2013). Impacted incisors are more common in males and have also been associated with dental anomalies such as ectopic teeth, hyperdontia and enamel hypoplasia (Bartolo, Camilleri et al. 2009). Impacted maxillary central incisors can be either hereditary or environmental in origin and is commonly caused by trauma to a deciduous tooth (Yaqoob, O'Neill et al. 2010). The most important diagnostic indicator that a central incisor is impacted is when the contralateral incisor has erupted more than 6 months prior.

Treatment invovled partial banding to regain space and exposure of the impacted 21 with an apically repositioned flap to bring it into occlusion. At the initial banding appointment, the 21 had spontaneously erupted and precluded the need for exposure and bonding of the 21 (Figure 2).

Figure 2. Photograph of spontaneous eruption of 21.

A 2 x 4 appliance was bonded, stainless steel wires placed with space opening mechanics and traction to tooth 21 (Figure 3).

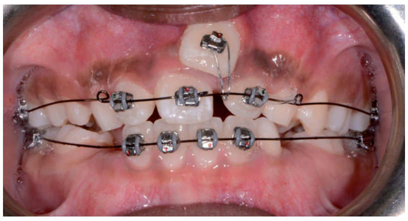


Figure 3. 2 x 4 appliance with stainless steel wires and space opening mechanics and traction to the erupted 21.

At 26 weeks (Figure 4), removal of the appliance was anticipated but the torque of 21 was less than satisfactory, thus requiring the use of a torquing auxillary to facilitate palatal root torque of the 21 and subsequently improve the anterior aesthetics.

At week 44, the appliance was removed with good aesthetic outcome for early intervention orthodontics (Figure 5). The periodontal outcome was less than ideal, with a thin band of attached gingiva developed through the spontaneous eruption of the 21 into the unattached mucosa. Ideally an apically repositioned

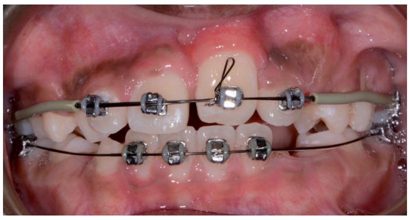


Figure 4. A torquing auxillary was placed at 24 weeks when alignment had been achieved.

flap or closed exposure would have achieved a thicker band of keratinised gingival tissue at the end of treatment. (Devine and Evans 2017) The aesthetics was acceptable to both the patient and his parents, thus highlighting a successful case in which early intervention orthodontics provided a great outcome in a relatively short period of time.

Figure 5. The final outcome at 44 weeks showing repositioned 21.

References

Arvystas, M.G. (1998). "The rationale for early orthodontic treatment."American Journal of Orthodontics and Dentofacial Orthopedics 113 (1): 15-18.
Bartolo, A., A. Camilleri and S. Camilleri (2009). "Unerupted incisors—characteristic features and associated anomalies."The European Journal of Orthodontics 32(3): 297-301.
Carter, K. and S. Worthington (2016). "Predictors of third molar impaction: a systematic review and meta-analysis."Journal of dental research 95(3): 267-276.
Chaushu, S., K. Kaczor-Urbanowicz, M.Zadurska and A. Becker (2015). "Predisposing factors for severe incisor root resorption associated with impacted maxillary canines."American journal of orthodontics and dentofacial orthopedics 147(1): 52-60.
Devine, C. and S. Evans (2017). "Impacted maxillary canines: a five year retrospective audit on the outcome of surgical exposure." British Journal of Oral and Maxillofacial Surgery 55(10): e90.
Fu, P.-S., J.-C. Wang, Y.-M. Wu, T.-K. Huang, W.-C. Chen, Y.-C. Tseng, C.-H. Tseng and C.-C. Hung (2013). "Unilaterally impacted maxillary central incisor and canine with ipsilateral transposed canine-lateral incisor." The Angle Orthodontist 83(5): 920-926.
Yaqoob, O., J. O'Neill, T. Gregg, J. Noar, M. Cobourne and D. Morris (2010). "Management of unerupted maxillary incisors."Available from: www.rcseng.ac.uk/fds/publications-clinical-guidelines/clinical_guidelines/docu-ments/ManMaxIncisors2010.pdf.
[Accessed June 2012].

ANZSPD SA Branch Post-Graduate **People's Choice Award**

Title: Management of a Permanent Trauma with Delayed Presentation

Emilija Ports, 1st year DClinDent Paediatric Dentistry, University of Adelaide

The reported case describes the dental management of an 8-year-old female who presented with an uncomplicated crown fracture and intrusion of tooth 21 by 8mm, eight and a half weeks after the initial trauma. The dental trauma occurred when the child had a collision with another child, causing her to fall and intrude her 21 on the edge of the water slide. Relevant history includes severe intellectual disability, a complex social history and remote access to dental care (160km from Adelaide).

The patient presented to the Emergency Department at the Women's and Children's Hospital, Adelaide, eight and a half weeks post-trauma. Examination showed mixed dentition with fair oral hygiene, 8mm intrusion of 21 with loss of inter-dental papilla and granulation tissue on the palatal surface (Figure 1). The uncomplicated crown fracture had been restored temporarily with GIC by her local dentist. Bitewing radiographs showed no pathology or dental caries. An anterior periapical radiograph demonstrates 21 with signs of periapical radiolucency and surface resorption in the coronal third of the root and an unerupted, inverted mesiodens in the maxillary midline. (Figure 2).

Figure 1. Intraoral photograph of the intruded 21, eight and a half weeks post the initial trauma.

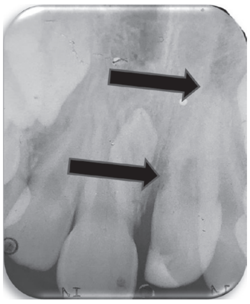


Figure 2. Periapical radiograph of intruded 21 with periapical radiolucency and surface resorption and inverted mesiodens.

There had been no spontaneous extrusion of the tooth over the 8 weeks, which would be expected for a luxation injury greater than 7mm and with a mature apex.(Flores, Andersson et al. 2007) Emergency management involved endodontic extirpation and calcium hydroxide dressing, composite restoration of the mesial-incisal fracture, surgical repositioning of the tooth and placement of a semi-rigid splint under general anaesthesia (Figure 3).

Figure 3. Intraoral photograph of the restored, repositioned and splinted 21.

A 4-week review was scheduled post-operatively, but due to ongoing difficulties travelling to Adelaide, this was delayed by 7 weeks. This posed an increased risk of ankylosis and compromise in the periodontal healing of this tooth. (DiAngelis, Andreasen et al. 2012) Upon examination at 7 weeks post emergency management, 21 had good gingival resolution and alignment, class 1 mobility and the splint was removed. A periapical radiograph taken at this time found minimal progression of the surface resorption (Figure 4).

Figure 4. Seven week post-operatively review showing gingival resolution and alignment of the 21 and minimal progression of surface resorption radiographically.

The ongoing management for this patient will involve three monthly review and redress of the 21 with periapical images to track the root resorption. Monitoring of the mesiodens is indicated due to risk of further damage to periodontal healing of 21 with surgical extraction. The long-term prognosis is guarded but the outcome of the management to-date has been provided a satisfactory aesthetic outcome for the patient.

References:

DiAngelis, A. J., J. O. Andreasen, K. A. Ebeleseder, D. J. Kenny, M. Trope, A. Sigurdsson, L. Andersson, C. Bourguignon, M. T. Flores and M. L. Hicks (2012). "International Association of Dental Traumatology guidelines for the management of traumatic dental injuries: 1. Fractures and luxations of permanent teeth." Dental Traumatology 28(1): 2-12.

Flores, M. T., L. Andersson, J. O. Andreasen, L. K. Bakland, B. Malmgren, F. Barnett, C. Bourguignon, A. DiAngelis, L. Hicks and A. Sigurdsson (2007). "Guidelines for the management of traumatic dental injuries. I. Fractures and luxations of permanent teeth." Dental traumatology 23(2): 66-71.

ANZSPD (NSW) SCIENTIFIC MEETING

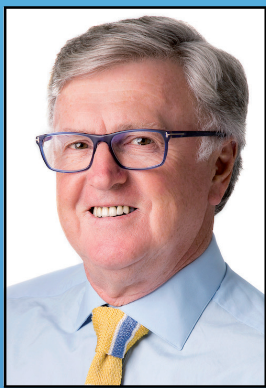
Friday 19th, October, 2018
Radisson Blu Hotel, Sydney CBD
8.30am - 5.00pm
(Registration commences at 8.00am)

International speaker

Prof. Monty Duggal
Discipline of Paediatric Dentistry
National University of Singapore

Prof. Ali Darendeliler
Chair, Orthodontics
University of Sydney

Dr Lydia Lim
Consultant, OMFS
Children's Hospital at Westmead



Dr James Lucas
Clinical Associate Prof.
University of Melbourne

Dr Craig Brown
Consultant Advisor,
ADA ((NSW Branch)

EARLY BIRD REGISTRATION FINISHES ON 17TH AUGUST, 2018

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Registration includes Morning Tea, Lunch and Afternoon Tea

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Registration fees	$595
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Up Coming *Events*

28 September 2018
ANZSPD(WA) Scientific Meeting
The University Club, Crawley, WA
anzspdwa@gmail.com

1 October 2018
ANZSPD(VIC) Edison Storey Memorial Lecture and AGM
secretary.anzspdvb@gmail.com

19 October 2018
ANZSPD(NSW) Scientific Meeting
Raddison Blu Plaza Hotel, Sydney
anzspd.nsw@gmail.com

20-21 October 2018
AAPD Scientific Meeting and 25th AGM
Sydney, NSW
www.aapdsydney2018.org.au

2-4 November 2018
IAPD Global Summit on Early Childhood Caries
Bangkok, Thailand
iapdsummit.org

15-16 March 2019
ANZSPD RK Hall Lecture Series
Perth, WA

3-7 July 2019
27th IAPD Cancun Congress
Cancun, Mexico
www.iapd2019.org

7-12 June 2021
28th IAPD Maastricht Congress
Maastricht, The Netherlands
www.iapd2021.org

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